ORIGINAL RESEARCH

Alternative Payment Models in Medical Oncology: Assessing Quality-of-Care Outcomes Under Partial Capitation

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BACKGROUND: Alternative payment models (APMs) in healthcare are emerging that reward quality of care over quantity of services. Most bundled payment programs that are described in published studies are related to episodes for a surgical inpatient hospital stay. With outpatient services, monthly capitated payments are an alternative to bundled payments for specialty services.

OBJECTIVE: To assess the association of a capitated contractual arrangement between a primary care physician group and an oncology clinic group with the quality of care received.

METHODS: We evaluated the effect of an oncology group's transition from a fee-for-service (FFS) arrangement to a partial-capitated-payment model with a primary care group. We compared outcomes for patients who received treatment after implementation of the new arrangement (ie, postcontract capitated group) with outcomes of patients receiving treatment before the change (ie, precontract capitated group). In addition, we conducted a parallel analysis of patients from a population that was not affected by the contract to assess temporal effects (ie, postcontract FFS group vs precontract FFS group). All patients were enrolled in Medicare Advantage plans of a single health plan (ie, Humana), and outcomes were measured using claims data provided by that company. Patients in the 2 precontract groups received treatment between July 1, 2010, and June 30, 2011; patients in the 2 postcontract groups received treatment between January 1, 2013, and December 31, 2013. Age- and sex-adjusted all-cause hospitalization, complications from cancer treatment, and ambulance transfers during 6 months of follow-up were evaluated.

RESULTS: In the population subject to the partial-capitated-payment model, the postcontract group (N = 305) was younger than the precontract group (N = 165). In a subset of patients in the 2 capitated groups who had Deyo-Charlson Comorbidity Index (CCI) RxRisk scores, the postcontract capitated group had significantly higher CCI scores. Adjusted odds ratios for the postcontract capitated group versus the precontract capitated group showed no difference in the likelihood that any of the outcomes would occur. However, the mean number of chemotherapy-related complications and ambulance transports were greater postcontract. In the parallel analysis of the population not affected by the new payment arrangement, no differences were found between the pre- and postcontract groups. This suggests that temporal changes potentially affecting patients in the capitated and FFS populations would not have influenced postcontract outcomes.

CONCLUSIONS: After the implementation of partial-capitated payments for medical oncology services in the oncology practice, the likelihood of a patient experiencing at least 1 event of a specific adverse outcome did not change; however, the average number of some adverse events did increase, which may in part be explained by a higher level of underlying morbidity in the postcontract group. The overall findings of this study suggest that quality of care was not compromised in this APM.

KEY WORDS: alternative payment models, ambulance transport, bundled payments, capitated payment, chemotherapy-related complications, Medicare Advantage plans, oncology service, partial-capitated payment, primary care, quality of care.

Am Health Drug Benefits. 2018;11(7):371-378
www.AHDBonline.com

Manuscript received September 27, 2017
Accepted in final form July 9, 2018

Disclosures are at end of text
Supplemental materials online

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KEY POINTS

- Healthcare reimbursement is switching from fee for service (FFS) to alternative payment models that reward quality of care over quantity of services.
- This claims-based exploratory study evaluated the impact of transitioning from FFS to partial-capitated payments using a capitated contract between primary care and oncology groups.
- The effect of the capitated contract on quality of care was evaluated using all-cause hospitalization, cancer treatment complications, and ambulance transfers.
- The average number of chemotherapy-related complications and ambulance transports increased after implementing a partial-capitated payment model, but the likelihood of >1 event did not change.
- No change in all-cause hospitalization or surgery-related complications was seen after the capitated-payment model was implemented.
- Because quality of care was upheld under the new payment model, its use by primary care groups that assume financial risk may enhance cost-management and retain benefits for patients.

As the US healthcare system moves away from fee-for-service (FFS) payments, alternative payment models (APMs) in healthcare are emerging that reward quality of care over quantity of services. There is a wide range of alternative and value-based payment arrangements. The Centers for Medicare & Medicaid Services (CMS) identified several such models as it moved 30% of Medicare payments to alternative payments by 2016.[1] Some examples include accountable care models, in which providers assume a range of financial risk and rewards based on quality of care; bundled, or episode-based payments of a single payment for multiple services during an episode of care; and non–visit-based care management payments coupled with data feedback and learning systems in primary care.[2] More than 30 commercial payers have joined CMS in this transition toward APMs as committed partners in the Health Care Payment Learning & Action Network, a group working to accelerate payment reform by aligning stakeholders across the public and private sectors.[3,4]

A cornerstone of many APMs and value-based payment models is primary care. A recent survey of the American Academy of Family Physicians' membership revealed that 40% of respondents were working under an accountable care or a similar value-based payment model.[5] Primary care physician groups in these APMs are challenged to work with specialty physician groups in innovative ways that value quality of care over quantity of services. A common APM that public and private payers have adopted is bundled (or episode-based) payments.[6-11]

A 2012 systematic review showed that most bundled payment programs described in published studies are associated with episodes for a surgical inpatient hospital stay.[12] Episode-of-care payments are more complex for outpatient specialist care. In the case of outpatient services, monthly capitated payments are an alternative to bundled payments for specialty services. However, by definition, capitated payments usually do not have a reward for quality. In contrast to FFS reimbursement, capitated payments do not incentivize unneeded services, but it is important to verify that capitated payments do not encourage undertreatment, which could result in poor health outcomes.

The objective of this study was to assess the association of a capitated contractual arrangement between a primary care physician group and an oncology clinic group with the quality of care received. Treatment-related complications and all-cause nonambulatory utilization were assessed as indicators of whether patients who were cared for under the capitated arrangement received good care.

The primary care group, MCCI Medical Group, is a physician group that includes more than 100 primary care physicians and 200 affiliated specialists in medical centers throughout Florida and Texas. The Texas population served by MCCI tends to have a low income, which affects the manner in which MCCI's patients use healthcare resources. MCCI has a value-based contract with Humana Inc. for patients covered by a Medicare Advantage prescription drug plan, in which MCCI is paid a risk-adjusted capitated rate for the care of each patient with a health maintenance organization (HMO) plan type.

One of the specialty groups in MCCI's geographic catchment area is Cancer Care Centers of South Texas (CCCST). On July 1, 2012, a new MCCI-CCCST contract went into effect, according to which, CCCST received a flat per-member per-month (PMPM) capitated payment rather than FFS reimbursement from MCCI. The partial-capitated PMPM payment to CCCST covered medical oncology, hematology, and radiation services, but not drugs or surgical services, which were still reimbursed on an FFS basis.

No additional payments were available based on quality measures. The PMPM cost was paid for MCCI's entire patient panel, regardless of the number of patients referred to CCCST for treatment. Notably, the July 2012 contract only applied to MCCI patients who were insured under an HMO type of Medicare Advantage prescription drug plan. CCCST care for patients referred from MCCI

with a non-HMO Medicare Advantage plan remained under an FFS payment arrangement with MCCI, which allowed a control group for evaluation in this study.

The focus of the study was to assess the potential for reduced quality of care under capitated payments of an oncology group; it was not our goal to assess the return on investment for the primary care group that issued the payment or the impact on costs to the health insurer. Although a full evaluation of chemotherapy and related spending was beyond the scope of this analysis, this study provides an important end point to assess the relationship between a payment model and treatment patterns.

Methods

We evaluated the effect of the transition by CCCST from an FFS contractual arrangement to the partial capitation payment arrangement for patients who were insured under a Humana Medicare Advantage HMO prescription drug plan. This population is referred to hereafter as the "capitated population." In addition, we also analyzed concurrent trends with continuing FFS reimbursement among patients with a non-HMO Humana Medicare Advantage plan, referred to hereafter as the "FFS population." The parallel comparisons between these 2 populations allowed an assessment of whether temporal changes that could affect all patients in both populations might have contributed to any differences between the precontract and postcontract groups in the capitated-payment population.

Because this study was conducted as part of the health plan's (ie, Humana) normal business operations, it did not meet the Department of Health & Human Services' regulatory definition of research under the 45 Code of Federal Regulations 46.102(d), and thus did not require Institutional Review Board approval. The authors have access to patients' identifying information through the course of their daily job responsibilities and have accessed such data to complete this study.

Patient Selection and Follow-Up

Patients aged 18 to 89 years were eligible for the study if they underwent at least 1 chemotherapy treatment at CCCST during a 1-year identification period, and were continuously enrolled in the Medicare Advantage prescription drug plan for 6 months after the initiation of treatment. Chemotherapy services were identified based on predetermined *Current Procedural Terminology* codes, *International Classification of Diseases, Ninth Revision, Clinical Modification* (*ICD-9-CM*) procedure codes, and Healthcare Common Procedure Coding System (HCPCS) codes (see **Appendix A** at **www.AHDBonline.com**).

Patients were separated into 4 groups according to Medicare Advantage prescription drug plan type (ie, capitated or FFS) and whether they received treatment before or after the new partially capitated payment arrangement between MCCI and CCCST that went into effect on July 1, 2012 (ie, precontract or postcontract); hence, the 4 groups were (1) precontract capitated, (2) postcontract capitated, (3) precontract FFS, and (4) postcontract FFS.

The precontract groups were restricted to patients who actively received chemotherapy between July 1, 2010, and June 30, 2011. The postcontract groups included patients who actively received chemotherapy between January 1, 2013, and December 31, 2013.

All groups were followed for a period of 6 months from the time of their first chemotherapy claim during the 1-year identification period. The 2 observation periods were designed to exclude the 6 months before and 6 months after the date on which the capitated contract became effective (ie, July 1, 2012). This reduced any potential confounding that might have been introduced by changes in practice patterns in anticipation of the new arrangement or by delays in response to the new arrange-

Table 1 Demographics and Morbidity Scores at Initiation of Chemotherapy, by Group Type

	Capitated groups		FFS groups		
Patient demographics	Precontract (N = 165)	Postcontract (N = 305)	Precontract (N = 55)	Postcontract (N = 188)	*P* value
Mean age, mean (SD)[a]	73.50 (7.88)	71.84 (7.99)	71.15 (8.87)	71.13 (9.02)	.04
Age, N (%)[b]					
18-64 yrs	15 (9.09)	36 (11.80)	6 (10.91)	28 (14.89)	.67
65-69 yrs	35 (21.21)	74 (24.26)	15 (27.27)	47 (25.00)	
70-74 yrs	43 (26.06)	83 (27.21)	13 (23.64)	47 (25.00)	
75-79 yrs	33 (20.00)	60 (19.67)	14 (25.45)	32 (17.02)	
80-84 yrs	25 (15.15)	37 (12.13)	7 (12.73)	24 (12.77)	
85-89 yrs	14 (8.48)	15 (4.92)	0	10 (5.32)	
Sex, N (%)[b]					
Female	113 (68.48)	190 (62.30)	37 (67.27)	115 (61.17)	.43
Male	52 (31.52)	115 (37.70)	18 (32.73)	73 (38.83)	
Morbidity scores					
Sample sizes, N[c]	49	284	12	39	
Deyo CCI (diagnosis-based), mean (SD)[a,d]	2.4 (2.6)	3.9 (3.2)	3.8 (2.8)	3.5 (3.6)	.03
RxRisk score (pharmacy-based), mean (SD)[a,d]	5.5 (2.6)	6.4 (3)	5.8 (3.5)	4.1 (3.6)	<.001

NOTE: Given the very small number (N = 12) of individuals in the precontract FFS group with morbidity scores, these scores are not likely to represent that group.
[a]Analysis of variance for comparisons across study group means.
[b]Chi-square tests for comparisons across study groups.
[c]Six months of continuous eligibility before the initiation of chemotherapy and sufficient data for score calculation during that period.
[d]Unpaired *t*-tests were used to determine if the subgroups were significantly different in pairwise comparisons. The CCI differed significantly ($P < .001$) between the precontract and postcontract capitated groups.
CCI indicates Charlson Comorbidity Index; FFS, fee-for-service; SD, standard deviation.

Table 2 Adjusted Association of Patient Group with Binary Outcomes in the 6 Months After Initiation of Chemotherapy: Reference Group, Precontract Capitated Group

Patient group	Parameter estimate	Odds ratio (95% confidence interval)[a]	*P* value
Inpatient admissions[b]			
Postcontract capitated	0.18	1.38 (0.88-2.19)	.21
Precontract FFS	0.028	1.19 (0.58-2.48)	.91
Postcontract FFS	–0.05	1.10 (0.66-1.84)	.74
Chemotherapy-related complications[c]			
Postcontract capitated	0.26	1.80 (1.01-3.24)	.14
Precontract FFS	–0.18	1.16 (0.45-3.00)	.57
Postcontract FFS	0.26	1.82 (0.97-3.40)	.17
Complications potentially related to cancer surgeries and procedures[d]			
Postcontract capitated	–0.11	0.87 (0.48-1.60)	.56
Precontract FFS	0.25	1.25 (0.51-3.06)	.40
Postcontract FFS	–0.17	0.82 (0.42-1.62)	.44
Ambulance use			
Postcontract capitated	0.32	1.63 (0.95-2.80)	.05
Precontract FFS	–0.019	1.16 (0.48-2.81)	.95
Postcontract FFS	–0.13	1.04 (0.56-1.94)	.51

[a]Odds ratios were generated by a logistic regression model with age and sex covariates.
[b]Any medical service provided in an inpatient hospital facility. Hospitalization claims with discharge and admission dates on the same day (reflecting a transfer) were considered a single hospitalization.
[c]Nausea, vomiting, or dehydration listed on any claim.
[d]Pneumonia, septicemia, or sepsis listed on any claim.
FFS indicates fee-for-service.

ment. Overall, the precontract capitated and FFS groups were selected between July 1, 2010, and June 30, 2011, and were followed for 6 months; the partial-capitated contract took effect July 1, 2012; and postcontract-capitated and FFS groups were selected between January 1, 2013, and December 31, 2013, and were followed for 6 months.

All-cause hospitalization, complications from cancer treatments, and the use of ambulance transfers were assessed as proxy measures of quality of care. All-cause inpatient admission was measured as a binary variable (ie, 0 or ≥1 events) and a continuous variable (ie, the mean number of admissions per patient).

Complications that potentially resulted from chemotherapy were identified by the presence of an *ICD-9-CM* code for nausea, vomiting, or dehydration on any healthcare visit claim (see **Appendix B** at **www.AHDBonline.com**). These complications were selected because published studies of administrative and Surveillance, Epidemiology, and End Results data have identified them as particularly common in patients receiving chemotherapy.[13-16]

Serious infections that potentially resulted from cancer surgeries or central-line insertion were identified by the presence of an *ICD-9-CM* code for pneumonia, septicemia, or sepsis on any healthcare visit claim; these events have been frequently cited as procedure-related complications (see **Appendix C** at **www.AHDBonline.com** for codes) in patients with cancer.[17-24] The 2 types of complications (ie, chemotherapy- and surgery/central-line–related) were evaluated as binary events and as continuous variables to capture the risk for at least 1 complication and the average number of complications. Ambulance transfers were identified by prespecified HCPCS codes and were evaluated as binary events and as continuous variables, with results stratified by emergency or nonemergency transport (see **Appendix D** at **www.AHDBonline.com**).

Statistical Methods

The summary statistics for all baseline characteristics and outcome measures entailed comparison across groups using analysis of variance for continuous variables and chi-square tests for categorical variables. Unpaired *t*-tests were used to test pairwise comparisons of means between subgroups.

For the presence of all-cause hospitalizations, complications related to cancer treatment, and ambulance services, the age- and sex-adjusted relative risk of an event (which was approximated as an odds ratio) was computed through logistic regression, with patient group as the main explanatory variable. For the number of inpatient admissions and ambulance services, the adjusted means were computed through a generalized linear regression model with a log-link and a negative binomial distribution, using the same independent variables as in the logistic regression models.

We constructed 2 variations of each model: 1 variation with the precontract capitated group as the reference group and 1 variation with the precontract FFS group as the reference group. This approach allowed us to assess change within each plan type population (precontract vs postcontract), as well as the precontract comparability of the 2 populations (precontract capitated vs precontract FFS) for each outcome measure.

Furthermore, we computed the Deyo-Charlson Comorbidity Index (CCI)[25-27] and the RxRisk score[10,11,28,29] for patients with 6 months of continuous preindex eligibility and sufficient data for calculation. The CCI was chosen as a measure of morbidity because it has been validated by its ability to predict mortality,[25,27] and the RxRisk score was chosen because it compares favorably with a clinical risk assessment tool (ambulatory clinical groups).[28] However, the numbers of patients with calculated CCI and RxRisk scores were too small for the incorporation of the risk scores into the regression models.

All data analyses were conducted using SAS Enter-

prise Guide version 5.1 (SAS Institute Inc; Cary, NC). The a priori alpha level for all inferential analyses was set at 0.05, and all statistical tests were two-tailed.

Results

The application of the inclusion criteria resulted in a total sample size of 713 patients. The 2 FFS groups were considerably smaller than the 2 capitated groups. **Table 1** shows that the patient groups did not differ by sex distribution, and the precontract capitated group was slightly older than the other groups, with significant difference across the 4 groups found only when the means were compared. In the subset of 384 patients for whom the 2 clinical risk scores could be computed, there was significant variation in clinical risk across the 4 groups, with the postcontract capitation group having the highest risk scores.

In subsequent pairwise comparisons between the subgroups, the CCI scores were significantly greater in the postcontract capitation group than in the precontract capitation group ($P < .001$). By contrast, the postcontract FFS group had lower CCI and RxRisk scores compared with their precontract FFS counterparts, but the difference was not significant. Unpaired *t*-tests were used to determine if the subgroups were significantly different in pairwise comparisons (Table 1).

The unadjusted comparisons of outcomes are presented in **Appendix E** (at **www.AHDBonline.com**).

Tables 2, 3, 4, and **5** present the results of regression analyses and show few significant differences in the adjusted outcome measures. Significant differences were observed in the number of chemotherapy complications and the number of ambulance transports between the precontract and postcontract capitated groups. No difference in any outcome measure was observed between the pre- and postcontract FFS population.

When the capitated and the FFS groups were compared precontract, no significant differences were found, which showed that the 2 patient populations were comparable before the capitated-payment contract went into effect. Overall, for most no significant differences were detected between the pre- and postcontract analyses.

In the pre- or postanalysis of the capitated groups, 2 outcomes—chemotherapy-related complications and ambulance services—were higher in the postcontract group than in the precontract group, but only when these outcomes were measured as continuous variables. The difference in mean chemotherapy-related healthcare visits was approximately 0.5 visits. The increase in ambulance services was more than 2 additional ambulance uses. These findings need to be interpreted in the context of the other finding (discussed below) that the likelihood of a chemotherapy-related visit or ambulance use was not associated with the contract.

Table 3 Adjusted Association of Patient Group with Binary Outcomes in the 6 Months After Initiation of Chemotherapy: Reference Group, Precontract FFS

Patient group	Parameter estimate	Odds ratio (95% confidence interval)[a]	*P* value
Inpatient admissions[b]			
Postcontract FFS	–0.054	0.92 (0.45-1.88)	.74
Precontract capitated	0.21	0.84 (0.40-1.74)	.39
Postcontract capitated	0.18	1.16 (0.59-2.27)	.21
Chemotherapy-related complications[c]			
Postcontract FFS	0.262	1.56 (0.65-3.77)	.17
Precontract capitated	–0.334	0.859 (0.33-2.21)	.14
Postcontract capitated	0.26	1.55 (0.66-3.63)	.14
Complications potentially related to cancer surgeries and procedures[d]			
Postcontract FFS	–0.169	0.656 (0.27-1.60)	.44
Precontract capitated	0.03	0.80 (0.33-1.95)	.90
Postcontract capitated	–0.11	0.69 (0.30-1.60)	.56
Ambulance use			
Postcontract FFS	–0.131	0.894 (0.38-2.11)	.51
Precontract capitated	–0.17	0.86 (0.36-2.07)	.42
Postcontract capitated	0.32	1.40 (0.63-3.13)	.05

[a]Odds ratios were generated by a logistic regression model with age and sex covariates.
[b]Any medical service provided in an inpatient hospital facility. Hospitalization claims with discharge and admission dates on the same day (reflecting a transfer) were considered a single hospitalization.
[c]Nausea, vomiting, or dehydration listed on any claim.
[d]Pneumonia, septicemia, or sepsis listed on any claim.
FFS indicates fee-for-service.

Discussion

For this study we assumed the cost-saving potential of a capitated-payment contract between a primary care organization and an oncology provider organization and assessed the risk for reduced quality of care. The general lack of significant differences between the precontract and postcontract capitated patient groups suggests that the APM arrangement did not adversely affect quality of care.

Because the differences between the precontract and postcontract groups in the FFS population were also not significant, it is unlikely that temporal changes unrelated to the new contract masked an adverse effect. In addition, the lack of significant differences between the capitated and FFS groups before the new contract suggests that the 2 populations were comparable before the new contract with respect to the outcome measures.

The patients in the capitated group were covered by an HMO plan, and patients in the FFS group were covered under a PPO plan. The lack of postcontract differences suggests that a preference for plan type did not influence the effect of the MCCI group's capitation of oncology services on outcomes.

The number of chemotherapy-related complications

Table 4 Adjusted Association of Patient Group with Continuous Variable Outcomes in the 6 Months After Initiation of Chemotherapy

Patient group	Adjusted mean number of events (95% confidence interval)[a]	*P* value
Inpatient admissions[b]		
Precontract capitated (reference group)	0.28 (0.20-0.41)	—
Postcontract capitated	0.41 (0.33-0.53)	.08
Precontract FFS	0.35 (0.19-0.62)	.57
Postcontract FFS	0.69 (0.40-1.19)	.01
Chemotherapy-related complications[c]		
Precontract capitated (reference group)	0.22 (0.12-0.41)	—
Postcontract capitated	0.75 (0.50-1.15)	.001
Precontract FFS	0.53 (0.21-1.38)	.12
Postcontract FFS	0.31 (0.17-0.56)	.37
Complications potentially related to cancer surgeries and procedures[d]		
Precontract capitated (reference group)	0.21 (0.11-0.40)	—
Postcontract capitated	0.34 (0.21-0.55)	.23
Precontract FFS	0.30 (0.10-0.89)	.58
Postcontract FFS	0.31 (0.17-0.56)	.37
Ambulance services		
Precontract capitated (reference group)	0.24 (0.12-0.49)	—
Postcontract capitated	2.44 (1.54-3.87)	<.0001
Precontract FFS	0.31 (0.10-0.97)	.72
Postcontract FFS	0.39 (0.21-0.73)	.31

[a]Means were generated by a negative binomial regression model with age and sex covariates.
[b]Any medical service provided in an inpatient hospital facility. Hospitalization claims with discharge and admission dates on the same day (reflecting a transfer) were considered a single hospitalization.
[c]Nausea, vomiting, or dehydration listed on any claim.
[d]Pneumonia, septicemia, or sepsis listed on any claim.
FFS indicates fee-for-service.

increased in the capitated population in the postcontract period. In addition, there was an increase in the number of ambulance transports, which can potentially be attributed to the capitated-payment arrangement, when the postcontract capitated group was compared with either the precontract capitated group or the precontract FFS group.

It is beyond the scope of this article to investigate whether clinician awareness of the payment contract might have contributed to these observed differences in safety outcomes; however, no significant difference in chemotherapy-related complications or ambulance use was observed when those outcomes were evaluated as binary variables. We could not find an explanation for this difference between the 2 subpopulations. Furthermore, in the subset of patients for whom CCI and Rx-Risk scores could be computed, the postcontract capitated group was sicker than the precapitated group.

Given the small number of patients with risk score data, it is possible that individuals in the postcontract capitated group differed from those in the precontract capitated group by random chance. Assuming that greater comorbidity would put patients at an increased risk for chemotherapy-related complications, confounding as a result of the difference in risk scores may account for the observed increases in the number of chemotherapy-related visits and ambulance transfers. However, we are unable to determine whether confounding existed, because the baseline morbidity data were only available for a subset of patients.

The general lack of significant outcomes differences is consistent with the possibility that the bias against the postcontract capitated group masked a reduction in morbidity associated with cancer treatment. The overall findings suggest that physicians' behaviors do not differ substantially according to patients' insurance plans or physicians' reimbursement contracts.

The evidence regarding APMs and value-based payment models for specialty care spans inpatient surgery, end-stage renal disease, radiation oncology, mental health, and medical oncology; pertains to payer reimbursement of specialists; and, in general, points to lower costs and to the potential to improve care.[7,9-12,30-32] This body of research is focused on bundled payments.

To our knowledge, this is the first study (whether by a payer or affiliated primary care groups) to investigate the effect of capitated payments to specialists on clinical outcomes. Our study initiates an evidence base to evaluate partial-capitated monthly payments from a primary care group to a specialty oncology group as a means to integrate the patient care of a specialist into a primary care–centric APM.

Future studies should evaluate other APMs, such as payments related to quality measures and care coordination, between primary care providers and medical specialists. Future studies may also build on this present analysis of oncology care outcomes by investigating the effect of capitation on expenditures associated with chemotherapy and other components of cancer care.

Limitations

This study has several limitations. Because this was an observational study to assess the actual contractual arrangements, we were unable to modify the terms of the contract for study evaluation purposes.

Although the outcomes were adjusted for age and sex, the analysis did not include controls for differences in baseline clinical risk profiles; therefore, confounding variables because of these factors are possible. Given the higher clinical risk in the postcontract capitated group compared with the precontract capitated group in the subset of patients for whom data were available (93% and

30% of the subgroups, respectively), a bias may potentially exist against the postcontract group. If such a bias existed, however, it would have served to mask a possible improvement in, not an adverse effect on, outcomes after the implementation of the capitation contract.

Furthermore, the lack of risk score data for the entire study sample might have affected the representatives of these data. Because the existing contract arrangement that was the focus of this study did not include chemotherapy services, there was no control for between-group differences in types of chemotherapy or the volume of chemotherapy utilization. These differences could have biased the complication rates and related utilization, but the direction of the bias is unknown.

In addition, the analysis did not take into account any differences in the use of radiation therapy. Thus, we cannot rule out that the oncology group used less radiation and more chemotherapy because the capitated payment was not for chemotherapy; this might have confounded the analysis of chemotherapy-related complications.

The results are also subject to the limitations of administrative claims data. Because administrative claims are used for payment rather than for clinical observation, variations in missing data or incorrect coding can occur. It is not possible to know the extent to which this affected the results. Coding practices should have been similar across CCCST clinics; however, there is greater incentive for accurate coding in FFS than in capitated arrangements. Furthermore, without access to the CCCST medical records, it was necessary to use claims to assess the incidence of treatment-related complications. Because the codes are generic and do not conclusively attribute the complication to the cancer treatment, misclassification might have biased the results. Organizational policy also precludes disclosing full details regarding the calculation of financial data.

Finally, a large proportion of patients served by the primary care group, MCCI, have low income and sometimes have inefficient utilization patterns, such as going to the emergency department rather than a physician's office because of transportation issues. Thus, these findings may not be generalizable to populations with different sociodemographic characteristics and care-seeking behaviors.

Conclusion

APMs and value-based payments offer the promise of delivering quality care with improved coordination at reduced cost, but also introduce the possibility of undertreatment. After the implementation of a partial-capitated-payment model for medical oncology in this physician group, no evidence of differences was seen in the majority of outcomes. The likelihood of all-cause hospitalizations, complications, or ambulance use did not change after the capitated payments were in place, although on average, patients had more complications and ambulance transfers in the postcontract era. This may partially be explained by a higher level of morbidity in the postcontract population, but it could also be attributable to group differences in the types of chemotherapy.

The overall findings from this exploratory study suggest that the quality of care was not compromised in this APM arrangement, which may allow primary care groups that assume financial risk to better manage their costs without sacrificing patient benefits. Further research about this with randomization or with matched samples is needed. ■

Table 5 Adjusted Association of Patient Group with Continuous Variable Outcomes in the 6 Months After Initiation of Chemotherapy

Patient group	Adjusted difference in mean number of events (95% confidence interval)[a]	*P* value
Inpatient admissions[b]		
Precontract FFS (reference group)	0.35 (0.19-0.62)	—
Postcontract FFS	0.35 (0.25-0.48)	.96
Precontract capitated	0.28 (0.20-0.41)	.57
Postcontract capitated	0.41 (0.33-0.53)	.57
Chemotherapy-related complications[c]		
Precontract FFS (reference group)	0.53 (0.21-1.38)	—
Postcontract FFS	0.69 (0.40-1.19)	.64
Precontract capitated	0.22 (0.12-0.41)	.12
Postcontract capitated	0.75 (0.50-1.15)	.51
Complications potentially related to cancer surgeries and procedures[d]		
Precontract FFS (reference group)	0.30 (0.10-0.89)	—
Postcontract FFS	0.31 (0.17-0.56)	.95
Precontract capitated	0.21 (0.11-0.40)	.58
Postcontract capitated	0.34 (0.21-0.55)	.84
Ambulance services		
Precontract FFS (reference group)	0.31 (0.10-0.97)	—
Postcontract FFS	0.39 (0.21-0.73)	.72
Precontract capitated	0.24 (0.12-0.49)	.72
Postcontract capitated	2.44 (1.54-3.87)	.001

[a]Means were generated by a negative binomial regression model with age and sex covariates.
[b]Any medical service provided in an inpatient hospital facility. Hospitalization claims with discharge and admission dates on the same day (reflecting a transfer) were considered a single hospitalization.
[c]Nausea, vomiting, or dehydration listed on any claim.
[d]Pneumonia, septicemia, or sepsis listed on any claim.
FFS indicates fee-for-service.

Author Disclosure Statement

Dr Loy and Ms Rogstad are employees of Humana; Mr Ems, Dr Murty, Ms Gallagher, and Dr Happe were employees of Humana during the study; Ms Finnel and Dr Fernandez have no conflicts of interest to report.

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